State of Illinois
Department of Transportation
Division of Highways
Springfield

SPECIFICATION FOR FAST-DRY PAVEMENT MARKING PAINT BLACK (Lead Free Waterborne Type)

Serial Number M135-05

I. SCOPE

This specification covers black pavement marking paint intended for application on portland cement and bituminous surfaced roadways using conventional waterborne pavement marking equipment capable of atomizing and applying the materials at temperatures up to 65 °C (149 °F). The specification governs the types and quantities of ingredient materials, the required characteristics of the finished paint, inspection procedures, and packaging requirements.

Any material delivered that fails to meet these specifications shall be disposed of by the vendor and immediately replaced with acceptable material entirely at the vendor's expense, including handling and transportation charges.

II. QUALITY REQUIREMENTS

The finished paint shall be formulated and manufactured from first-grade materials. It shall be free from defects and imperfections that might adversely affect the serviceability of the finished product. It shall be completely free from dirt and other foreign material and shall dry within the time specified to a good, tough, serviceable film. The paint shall show no evidence of excessive settling, gelling, skinning, spoilage or livering upon storage in the sealed shipping containers under normal above freezing temperatures within twelve (12) months of delivery. Any settled portion shall be easily brought back into suspension by hand mixing. When the settled portion is brought back into suspension in the vehicle, the paint shall be homogeneous and shall not show a viscosity change of more than 5 KU from the original viscosity. Any paint that has settled within the period of l2 months after delivery to the degree that the settled portion cannot be easily brought into suspension by hand mixing shall be disposed of by the vendor and immediately replaced with acceptable material entirely at the vendor's expense, including handling and transportation charges. The paint, when applied by spraying methods to a bituminous pavement, shall not be discolored due to the solvent action of the paint on the bituminous surface.

III. INGREDIENT MATERIALS

A. Carbon Black

This material shall be a carbon black pigment either powdered or pre dispersed form.

B. Calcium Carbonate.

This material shall comply with the latest revision of the Specification for Calcium Carbonate Pigments, ASTM D 1199, Type GC, Grade I, with a minimum of 95% Calcium Carbonate or Type PC, minimum 98% Calcium Carbonate.

C. Acrylic Emulsion Polymer

This material shall be Rohm and Haas 2706 or Dow Chemical DT-211.

D. Methyl Alcohol

This material shall comply with the latest revision of the Specification for Methyl Alcohol, ASTM D 1152.

E. Miscellaneous Materials

1. Water: Potable.
2. Dispersant: Tamol 850 (Rohm and Haas) or equivalent
3. Surfactant: Triton CF-10 (Union Carbide) or equivalent
4. Defoamer: Colloids 654 (Rhone-Poulenc) or equivalent
5. Rheology Modifier: Natrasol 250 HBR (Aqualon Company) or equivalent
6. Coalescent: Texanol (Eastman Chemical).
7. Preservative: Troy 192 (Troy Chemical) or equivalent

IV. MANUFACTURE

All ingredient materials shall be delivered in the original containers and shall be used without adulteration.

The manufacturer shall furnish to the Department the batch formula which will be used in manufacturing the paint.

No change shall be made in this formula without prior approval by the Department and no change will be approved that adversely affects the quality or serviceability of the paint.

The following Standard Formula shall be the basis for the paint. The finished product shall conform on a weight basis to the composition requirements of this formula. No variations will be permitted except for the replacement of volatile lost in processing. Amounts are shown in kilograms (pounds) of material.

Carbon Black	9.53(21)**
Calcium Carbonate	362.87(800)
Rheology Modifier	0.23(0.5)*
Acrylic Emulsion, 50% Solids	196.77(434)
Coalescent	9.53(21)
Preservative	0.68(1.5)
Defoamer	2.27(5.0)
Dispersant	3.18(7.0)
Surfactant	1.13(2.50)
Methyl Alcohol	13.61(30)
Aqua Ammonia	0.23(0.50)
Water	26.79(59)**
Total Kilograms (Pounds)	626.82(1382)

*Rheology Modifier amount may be varied by up to 0.05 kg (0.1 pound) to adjust viscosity to desired range.

**Carbon black and water content may vary depending upon the pigment form used. Both must be adjusted to meet the following paint properties.

V. PAINT PROPERTIES

The finished paint shall meet the following requirements:

A. Pigment

Analysis of the extracted pigment shall conform to the following requirements:

Carbon Black (%)	1.5 Min.
Calcium Carbonate (%)	58 Min.

The percent pigment by weight of the finished product shall not be less than 57.5% nor more than 61.5%.

B. Vehicle
The non-volatile portion of the vehicle shall be composed of a 100% acrylic polymer and shall not be less than 38% by weight.

C. Organic Volatiles
The finished paint shall contain less than 150 grams of volatile organic matter per liter of total paint (ASTM D3960).

D. Total Solids
The finished paint shall not be less than 75% total non-volatile by weight (ASTM D2369).

E. Unit Weight
The unit weight at 25 °C (77 °F) of the production batches shall not vary more than plus or minus 0.024 kg/l (0.2 pounds per gallon) from the weight of the qualification samples.

F. Viscosity
The consistency of the paint shall not be less than 78 nor more than 88 Krebs Units at 25 °C (77 °F).

G. Dry Opacity
The minimum contrast ratio shall be 0.97 when tested in accordance with Federal Specification Method 141a, No. 4121, Procedure B, when applied at a wet film thickness of 0.38 mm (15 mils).

H. Water Resistance
The paint shall conform to Federal Specification TT-P-1952D, Section 3.2.5.

I. Freeze-Thaw Stability
The paint shall show no coagulation or change in consistency greater than 10 Kreb Units, when tested in accordance with Federal Specification TT-P-1952D, Section 4.3.8.

J. Accelerated Package Stability
The paint shall show no coagulation, discoloration, or change in consistency greater than 10 Kreb Units when tested in accordance with Federal Specification TT-P-1952D, Section 4.3.4.

K. Dilution Test
The paint shall be capable of dilution with water at all levels without curdling or precipitation such that the wet paint can be readily cleaned up with water only.

L. Storage Stability
After 30 days storage in a three-quarters filled, closed container, the paint shall show no caking that cannot be readily remixed to a smooth, homogenous state, no skinning, livering, curdling, or hard settling. The viscosity shall not change more than 5 Kreb units from the viscosity of the original sample.

M. No-Pick-Up Time
The no-pick-up time shall be less than 10 minutes. The test shall follow the requirements of ASTM D711 with a wet film thickness of 0.38 mm (15 mils).

N. Grind
The paint shall have a grind of not less than 3 on a Hegman Grind Gauge.

O. Flexibility
The paint shall show no cracking or flaking when tested in accordance with Federal Specification TT-P-1952D, Section 4.3.5.

P. Dry Through Time
The paint, when applied to a non-absorbent substrate at a wet film thickness of 0.38 mm (15 mils) and placed in a humidity chamber controlled at 90 $\pm$ 5% R.H. and 22.5 $\pm$ 1.4°C (72.5 $\pm$ 2.5°F), shall have a "dry through time" not greater than 15 minutes of the IDOT standard formula. The dry through time shall be determined according to ASTM D1640, except that the pressure exerted shall be the minimum needed to maintain contact with the thumb and film.

Q. No-Tracking Time Field Test
The paint shall dry to a no-tracking condition under traffic in three minutes maximum when applied at 0.38 $\pm$ 0.03 mm (15 $\pm$ 1 mil) wet film thickness at 54.4°-65.6°C (130°-150°F), and from three to ten minutes when applied at ambient temperatures. "No-tracking" shall be the time in minutes required for the line to withstand the running of a standard automobile over the line at a speed of approximately 64 km/hour (40 mph), simulating a passing procedure without tracking of the line when viewed from a distance of 15 m (50 feet).

VI. SAMPLING AND INSPECTION

A. Sample
The manufacturer shall forward to the Engineer of Materials and Physical Research, 126 East Ash Street, Springfield, Illinois 62704, for test purposes, three ½-liter (pint) qualification samples of material representative of that which he/she proposes to produce.

Along with the samples, the paint manufacturer shall furnish a copy of his/her batching formula and a list of the trade names and manufacturers of the ingredient materials proposed for use. Product data sheets shall be provided as verification of the ingredient materials conformity with the specification requirements. No changes shall be made without prior approval by the Department.

B. Sampling and Testing
Unless otherwise provided, all materials shall be sampled and tested in accordance with the latest published standard methods of the American Society for Testing and Materials, and revisions thereof, in effect on the date of the invitation for bids, where such standard methods exist. In case there are no ASTM Standards which apply, applicable standard methods of the American Association of State Highway and Transportation Officials, or of the Federal Government, or of other recognized standardizing agencies shall be used.

C. Inspection

The right is reserved to inspect the paint either at the place of manufacture or after its arrival at destination. If inspected at the place of manufacture, the manufacturer shall furnish such facilities as may be required for collecting and forwarding samples of ingredient materials and finished paint and for performing the inspection of the paint during the process of manufacture. Before manufacture of the paint is started, the ingredient materials shall be set aside at the manufacturer's plant and shall be sampled by an authorized representative of the Department. All materials represented by these samples shall be held until tests have been made and the materials found to comply with the requirements of the specifications. Approximately 30 days are required to test the ingredient materials. The Department has the option to waive inspection of ingredient materials. During the manufacturing operations, the Department's representative shall have free entry at all times to such parts of the plant as concern the manufacture of the paint. All tests will be made by and at the expense of the Department unless otherwise specified.

All material samples for acceptance tests shall be taken or witnessed by a representative of the Department and will be submitted to the Engineer of Materials and Physical Research, 126 East Ash Street, Springfield, Illinois 62704.

VII. PACKAGING

Unless otherwise directed, the paint shall be packaged and shipped in new 55-gallon removable head, steel drums meeting the latest regulations of the United States Department of Transportation for shipping containers for this type of material. The drums shall be lined with a non-corrosive lining compatible with the waterborne paint. The opening in the drum shall be circular, and the diameter of the opening shall be substantially the diameter of the inside of the end of the drum. The drum shall be provided with gaskets of one-piece tubular neoprene construction and shall be completely airtight. The closure shall be securely attached to the drum by a bolt-action-type ring that shall enclose the edge of the lid and the chime of the drum. The closure bolt shall be tightened to a minimum of 54 N•m (40-ft. lbs.) torque, and a lock nut shall be securely tightened against the threaded end of the anchor. The paint shall be packaged in white drums with gray lids.

Fifty-five gallons of paint shall be placed in each drum, leaving approximately 5 cm (2 inches) of air space. The paint shall be measured by volume, the unit of measure being a gallon of 23l cubic inches at 25 °C (77 °F).

Each drum shall be stenciled on the removable head and on the side to show the kind of paint contained therein, the manufacturer's name, the lot number, and the month and year the paint is packaged.

This specification is effective September 12, 2005, and supersedes Serial Number M 135-00, effective May 1, 2000.

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